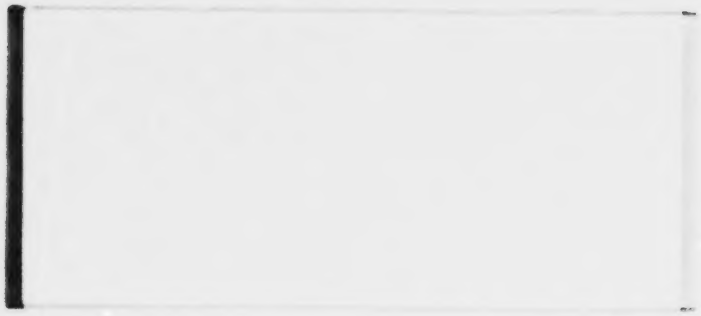

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TITLE "SELECTION OF MINERAL DEPOSITS IN NEWFOUNDLAND SUITABLE FOR RESEARCH"

# SELECTION OF MINERAL DEPOSITS IN NEWFOUNDLAND SUITABLE FOR RESEARCH

Project No. H85389

Submitted to:

Department of Supply and Services

by:

Nolan, Davis & Associates Limited

AUG 19 1986

MICROMEDIA

June 1986

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NOLAN, DAVIS & ASSOCIATES
(NS) LIMITED
CONSULTING ENGINEERS AND GEOLOGISTS

June 26, 1986
File No. H85389

Supply and Services Canada
Science Branch
11C1, Phase III
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Hull, Quebec
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Attention: Mr. R. Berti

Dear Sir:

RE: Selection of Mineral Deposits in Newfoundland
Suitable for Research
DSS File No. 07SQ.23440-5-9155

Please find enclosed eleven (11) copies of our report in regard to the above mentioned project. If you have any questions concerning the information contained in this report, please contact us at your convenience.

Yours truly,

NOLAN, DAVIS & ASSOCIATES

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## 1.0 INTRODUCTION

A study of Newfoundland and Labrador mineral deposits was undertaken by Nolan, Davis and Associates Limited, St. John's, Newfoundland, to select two deposits most suitable for future mineralogical and metallurgical research and possible development. It was undertaken for the Canada Centre for Mineral and Energy Technology (Canmet), Energy, Mines and Resources Canada, under Contract No. 0SQ85-00239. This study was comprised within a particular phase of the mining and minerals technology program of the Canada-Newfoundland subsidiary agreement on mineral development, 1984-1989. Scientific direction was provided by Dr. J. L. Jambor. Contract management was provided by Mr. R. Berti, Supply and Services Canada.

## 2.0 ACKNOWLEDGMENTS

The cooperation and assistance provided by personnel of the Newfoundland Department of Mines and Energy are gratefully acknowledged.

## 3.0 DATA SOURCES

The investigation involved a review of all publicly available data on both metallic and industrial mineral deposits of Newfoundland and Labrador. The data sources included: the Newfoundland Department of Mines and Energy, mineral inventory

files; company assessment files at government offices in St. John's; federal and provincial government geological publications; university theses; geoscience publications; and the consultant's files. Discussions with geoscientists familiar with the various geologic environments were particularly helpful.

As is inherent in most studies of this nature, there were problems in correlating work by others, in terminology and with possible omissions and incomplete records. The confidentiality, and thus unavailability, of some company reports restricted the review and compilation of pertinent data in a number of instances. Additionally, although company reports were the prime data source for most deposits, these reports essentially pertain to exploration activities with little discussion of those aspects, mineralogy and metallurgy, relevant to this particular requirement.

## 4.0 SELECTION PROCESS

The initial selection process involved a search of the Newfoundland Department of Mines and Energy files, St. John's, Newfoundland, and the contractor's files for all mineral deposits with reported tonnage and grade data. A total of 19 of these deposits were selected for further analysis based on one or more of the following criteria:

i) An arbitrary tonnage-grade product in excess of one million for base metal deposits,

ii) polymetallic deposits which may be less affected by market variations in any one particular commodity,

iii) deposits having a relatively high zinc content as the zinc market is expected to experience recovery before those of the other base metals,

iv) industrial mineral deposits of considerable size and/or having current interest and demand,

v) deposits having an inactive development status rather than those being actively developed or having an exploration status.

Thus, deposits such as Chetwynd gold and St. Lawrence fluorspar were considered active developments. The Little Deer, Lockport, Victoria, Betts Cove, and Round Pond deposits were judged to be exploration prospects. Others, such as Gullbridge, Whalesback, and Tilt Cove, were eliminated because known reserves have been depleted. Rambler and Newfoundland Zinc Mines were eliminated as current closures did not result from metallurgical problems. Iron ore has also been excluded as it is understood it is being studied separately. It should be noted that many of the base metal deposits have some gold potential. However, these presently only have an exploration status for gold.

All publicly available data were reviewed on 19 deposits thus selected. Table 1 lists the deposits, their location, and the commodities involved. These deposits were subsequently evaluated on the basis of the criteria described and discussed in the following section. On the basis of this evaluation, a short list of five deposits of interest was

## TABLE 1

### DEPOSITS REVIEWED

| | Name | District/Area | Commodity |
|---|---|---|---|
| 1. | Buchans | Buchans | barite in tailings |
| 2. | Cape Ray | Long Range Mountains | gold |
| 3. | Colchester | Green Bay | copper |
| 4. | Great Bend | Fortune Bay - Hermitage | magnesite |
| 5. | Great Burnt Lake | Burgeo - Bay d'Espoir | copper |
| 6. | Lake Bond | Buchans | zinc, copper |
| 7. | Labrador City | Labrador City | silica |
| 8. | La Scie | Baie Verte Peninsula | silica |
| 9. | Letitia | Naskaupi, Labrador | beryllium, niobium |
| 10. | Michelin | Makkovik, Labrador | uranium |
| 11. | Pilley's Island | Notre Dame Bay | copper (lead, zinc, silver?) |
| 12. | Ronan | Port au Port Peninsula | barite, celestite |
| 13. | St. Georges | St. Georges | potash |
| 14. | Skidder | Buchans | copper, zinc |
| 15. | Strange Lake | Nain, Labrador | zirconium, yttrium, niobium, rare earths |
| 16. | Strickland | La Poile | lead, zinc, silver |
| 17. | Tally Pond | Buchans | copper, zinc, silver |
| 18. | Tulks Hill | Buchans | zinc, lead, copper |
| 19. | York Harbour | Bay of Islands | copper, zinc |

established for detailed review. This group included: Cape Ray (gold); Labrador City (silica); Ronan (barite-celestite); Strange Lake (zirconium-yttrium-niobium-rare earths); and Tulks Hill (zinc-lead-copper). These deposits will be discussed in some detail. Pertinent aspects of the remaining fourteen deposits are outlined in Appendix I. Finally, two deposits will be selected for further study, and justification for this selection presented.

## 5.0 EVALUATION CRITERIA

### 5.1 General

Information was collected for 19 deposits which pertained to ownership, tonnage, grade, geology, current status, and degree of development and delineation. Previous work, the results, and the investigators have been identified. The degree of owner interest, support, and cooperation in further mineralogical and metallurgical investigations was solicited for those deposits selected for the short list.

### 5.2 Economic Viability

Attempts were made to assess the economic viability of the deposits reviewed. However, the general lack of pertinent data made this task difficult. Any detailed feasibility or marketing studies which may have been carried out by the owners

have not been made public. Undertakings of this nature obviously were beyond the scope of the present investigation. Lack of pertinent data also made it difficult to judge how soon any deposit may reach a commercial stage. All deposits on the short list are thought to have some potential for further development. They are considered to be those for which development would be most beneficial to Newfoundland and Labrador. It should be remembered that, in this respect, only deposits within the inactive development category are being considered.

Development of new mineral resources in Newfoundland and Labrador could mean market competition with present and planned mining operations elsewhere in Canada. This is particularly relevant with the existing market conditions. There is some controversy at the present time regarding the reopening of a former zinc producer, supposedly with the aid of government funding, in northern Canada. It is being argued that government funding should not be used, particularly in tight market situations, where the increased supply of a commodity prohibits development of other projects not requiring such funding. Perhaps the socio-economic benefits should be considered in these conflicts. If there is a choice, it may be more appropriate to ensure the continuation of mining in an area than it would be to establish an operation in an entirely new area.

Location on the eastern seaboard of North America and accessibility by water to major markets provides Newfoundland and Labrador mining developments with an economic advantage over

those of central and northern Canada. Although Nova Scotia, New Brunswick, and eastern Quebec may enjoy similar advantages, the mineral potential of these regions is thought to be no greater than that of Newfoundland and Labrador.

## 5.3 Socio-Economic Impact

Any new mineral development in Newfoundland and Labrador would benefit both Canada and the Province. It would have a positive effect on direct labour and its multiplier factor. The creation of 100 to 300 new, direct jobs may be anticipated, particularly for any new metallic mineral development. Considerably fewer jobs, however, would result from any industrial mineral development. In addition to direct employment, any new mineral development would contribute to substantial employment elsewhere in the economy. The employment multiplier as relates to the mining industry in Newfoundland is approximately 2; that is, for every mining job, there are two additional jobs created elsewhere in the economy. In other provinces with an active mining industry, the multiplier is closer to 3. This is due largely to the availability within those provinces of greater support in manufacturing and supply of products required by the industry. All employment requirements are thought to be available within the province. Some retraining of the local labour force may be required. However, this should be minimal as trained labour is presently available as a result of the generally depressed condition of the mineral industry.

The creation of new jobs translates into decreases in welfare and unemployment insurance benefits and an increase in income tax revenues. A new mining development would increase that sector's contribution to the Real Domestic Project of the province. Material requirements would increase sales tax revenue, while a viable operation would generate corporate tax revenues.

The impact of a new mineral development on existing housing, utilities, transportation, and community and social infrastructure would vary from site to site. The impact would be negligible for sites like Buchans and Labrador City. However, at the other extreme, all these facilities would be required at sites like Strange Lake. The latter sites could have a negative benefit effect on governments as they may be requested to contribute funding for the required facilities.

## 5.4 Technology

Having established tonnage and grade for any deposit, it then becomes necessary to ascertain whether or not the ore can be processed economically. The processing of ore involves the separation of a particular mineral or minerals from other minerals and waste material, or beneficiation or upgrading to meet required product specifications. Profitable extraction of minerals from ores requires quantitative mineralogical studies to define any inherent problems and ore testing to solve these problems and to develop appropriate separation techniques.

Solutions to defined problems are not always straightforward. Trial and error approaches are often involved, and success is often contingent on the experience of the researcher. Ore testing may include: size fraction analysis; gravity concentration tests, magnetic and electrostatic separation tests; flotation tests; hydrometallurgical and pyrometallurgical tests; and chemical and biochemical leaching tests. In instances where difficulties persist, it may be necessary to seek a balance between concentrate grade and recovery. This often results in impure concentrates and metal rich tailings. As a consequence, there may be revenue losses from the quantities produced because of poor recovery, and from the quality of the product because of lesser valued end-product use or smelter penalties.

Some of the more common problems encountered in processing of both metallic and industrial mineral ores result from; the complexity of the mineralogy; intragranular and intergranular relationships; grain size and the degree of grinding required for liberation; oxidation and secondary enrichment coatings on grains; and, process interference by other minerals and/or gangue. Problems encountered in the early days with the Buchans massive sulphide ores included: the fine grained nature of the ore; the large percentage of galena-sphalerite intergrowths; the essentially inert and refractory

character of some of the sulphide minerals due to surface oxidation; and, the comparative ease with which calcite and barite float under intense flotation conditions. Grain size, complex mineralogy and mineral intergrowths also created problems in the processing of the New Brunswick massive sulphide ores. Fine grinding to achieve acceptable levels of liberation cause serious loss to tailings of fine particles in flotation processes. Plant experiments are being conducted on these ores to optimize the concentrate grade, and to treat a "middling" concentrate by sulphate roasting to enhance recoveries.

All deposits on the established short list are considered to be at the stage of development which warrants mineralogical and metallurgical testing. Unfortunately, as previously cited, there is little publicly available information which pertains to the mineralogy and metallurgy of the individual deposits. It is suspected that at least some preliminary studies have been undertaken. However, few results have been reported. Due to this general lack of data, definition of potential problems, in most instances, can only be achieved through inference. Existing facilities for bulk sampling, etc., may be available at such sites as Buchans and Labrador; however, some reconditioning and modification should be anticipated. The availability of metallurgical samples for the proposed study varies from deposit to deposit. Surface sampling of some deposits may be possible, whereas diamond drill coring would be required of others.

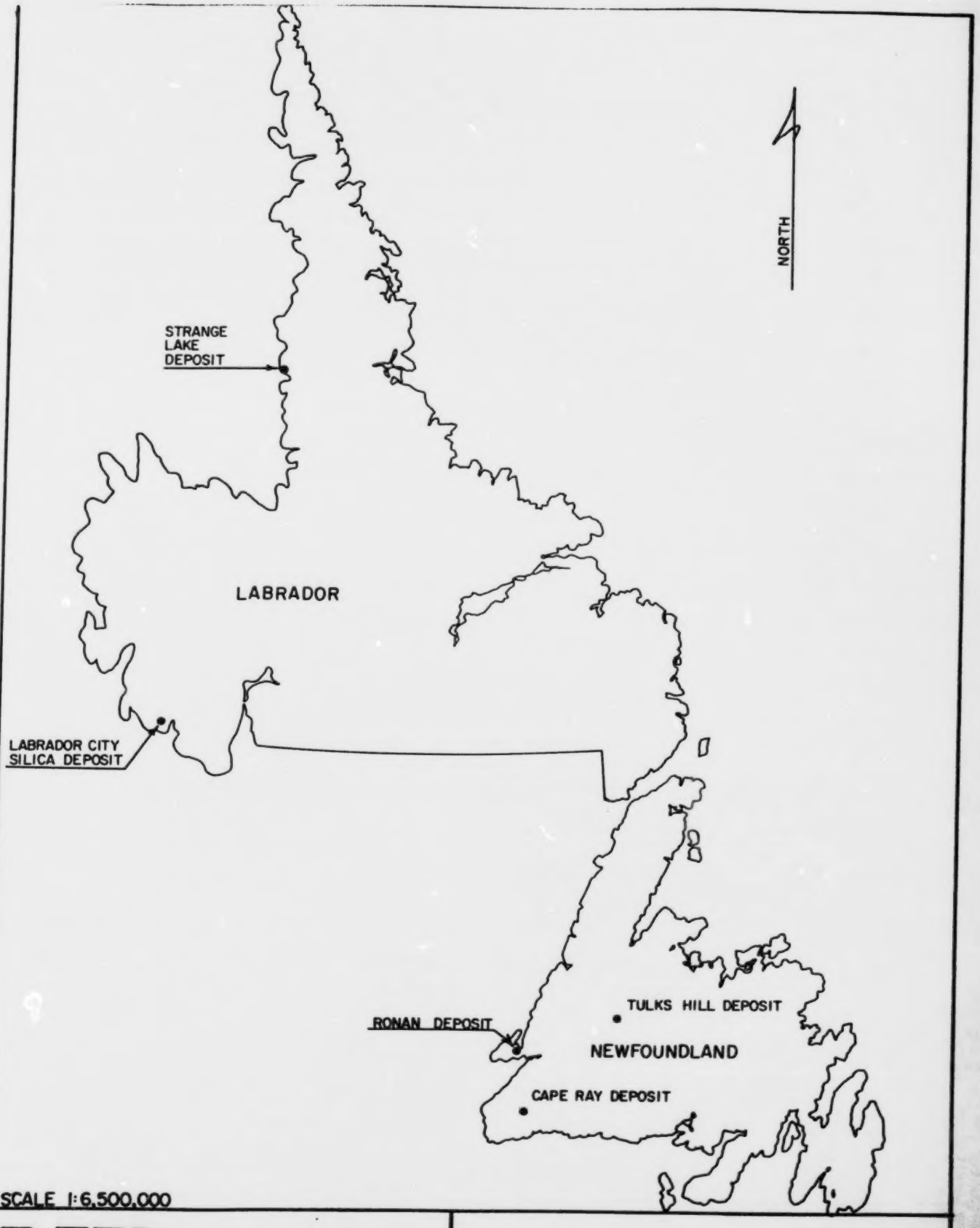
## 5.5 Environmental Impact

The environmental implications of developing new mineral deposits can be an important factor both in terms of the cost of meeting regulatory requirements, and in the additional time involved in the development sequence to provide monitoring of background conditions, preparation of an environmental impact assessment, design of any treatment facilities required, and for obtaining permits.

The degree to which environmental considerations influence the cost and scheduling of a project are very specific to the type of mineral involved, mining method, and sensitivity of the local environment. In this report, a section is included for each of the five deposits reviewed in detail in which any environmental implications that can currently be identified with the project are described. Since no site-specific environmental data has been examined as a function of the study, the comments are purely generic in nature.

# 6.0 DEPOSITS REVIEWED IN DETAIL

A total of five deposits were judged to be of particular interest, and these were reviewed in considerable detail. These deposits include: Cape Ray (gold); Labrador City (silica); Ronan (barite-celestite); Strange Lake (zirconium-yttrium-niobium-rare earths); and Tulks Hill (zinc-lead-copper), see Figure 6-1.

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# DEPOSIT SITE LOCATION MAP

H85 389

FIGURE 8-1

## 6.1 Cape Ray - Gold

### 6.1.1 General

#### 6.1.1.1 Location:

District: Long Range Mountains
N.T.S. 10-0-15
Latitude: 47° 45'39"
Longitude: 58° 55'07"

#### 6.1.1.2 Principal Owner:

New Venture Equities,
Toronto, Ontario

#### 6.1.1.3 Setting

The site is located in a remote area at an altitude of 400 metres above sea level. Local physical features include numerous small lakes in a highland region devoid of significant tree growth.

#### 6.1.1.4 Description of Deposit

a) Commodity and Associated Minerals

Electrum occurs with associated chalcopyrite, sphalerite, galena, and pyrite. The electrum contains 15 to 65 mole percent silver.

b) Host Rock and Character of Deposit

The mineralization is hosted by graphitic and chloritic-sericitic schists of the Upper Devonian Windsor Point Group which occurs within the Cape Ray Fault zone. The electrum-sulphide mineral assemblage occurs with boudinaged quartz veins

SCALE 1:250,000

NOLAN, DAVIS & ASSOCIATES

CAPE RAY DEPOSIT
LOCATION MAP

H65389

FIGURE 6-2

which pinch and swell to attain thicknesses of up to 2.4 metres. These quartz veins are in en-echelon pattern within three isolated zones which are subconcordant with the host schists. The main mineralized zones are separated by weakly mineralized to barren intervals. Additional precious metals-sulphide mineralized quartz veins have been discovered nearby in the Windowglass Hill granite.

c) Tonnage and Grade

Exploration to date has delineated 750,000 tonnes, grading 9 grams of gold per ton. Further exploration could result in the discovery of additional zones, thus increasing the tonnage.

d) Previous Investigations

In 1968, Brinex completed a multi-element regional geochemical survey and undertook some follow-up of the resulting anomalies. Phillips Management, in 1975, carried out general exploration which led to the discovery of base metal mineralization with some associated precious metals. The property was optioned to Amax Inc. in 1976, but later dropped after two short drill holes failed to intersect significant mineralization. Diamond drilling of 600 metres in 29 holes by Riocanex in 1977 outlined a fairly continuous, but erratically mineralized, gold base metal zone. Further drilling in 1978 and 1979 led to the discovery of two additional zones. The

Windowglass Hill prospect was discovered and evaluated by general exploration and diamond drilling in 1979 and 1980. In 1983, D. H. C. Wilton completed research studies on the property at Memorial University, St. John's, Newfoundland. During 1984 and 1985, New Venture Equities conducted underground test work to determine the continuity and mineability of the deposits. It is understood that the test was successful and that further exploration is planned.

### 6.1.2 Economic Viability

The deposit is not considered to be a developed prospect as there are indications that it is not economic at present gold prices. However, the discovery of additional mineralized zones as a result of the planned exploration could alter this status. Concern has been expressed over the mineability of the deposit due to the physical instability of the schistose host rocks. In the winter of 1984-85, the roof of the decline collapsed near its intersection with the vein. These troublesome graphitic schists are present in both the hanging wall and footwall. A rock mechanics study may be warranted if development of this deposit is seriously considered.

Diamond drill core from this deposit is stored at the Department of Mines Core Storage Facility in Pasadena, Newfoundland.

### 6.1.3 Socio-Economic Impact

The creation of employment with retraining of the local work force as a result of development of this deposit would have a positive impact on this region of the province. The provision of employment for the province's unemployed miners would also be a positive effect. Construction of an access road to the deposit would permit servicing from the Town of Port aux Basques and the surrounding communities. The impact on existing housing, utilities and community and social infrastructure should be minimal.

Viable development of a gold deposit at Cape Ray, together with the gold deposit at Chetwynd, could have a very positive effect on the mineral industry's attitude toward the potential for gold development in the province. High levels of gold exploration by an increased number of participants would, hopefully, result in the discovery of other deposits.

### 6.1.4 Technology

The deposit is certainly at the stage of development to warrant metallurgical testing. Although not reported, testing supposedly undertaken by the owner has yielded satisfactory results. Wilton (1983) described the occurrence of electrum in minute grains of up to 0.8 millimetres in diameter, but usually

less than 0.02 millimetres. It occurs in quartz veins intergrown with pyrite and, to a lesser extent, with chalcopyrite, galena and spalerite. It also occurs as distinct grains near sulphide concentrations. Electron probe analysis indicated 15 to 64 mole percent silver in the electrum. Gold to silver ratios range from 0.55 to 5.83.

Notwithstanding the supposedly satisfactory results of previous testing, further study to enhance recovery may be warranted because of the type and complexity of the mineralogy. For instance, refractory coatings on the silver could result in loss of precious metals due to lack of penetration of the cyanide solutions (Gasparrini, 1983). A similar problem could result with coatings of iron oxide or secondary copper minerals. Additionally, if the electrum is finely intergrown with pyrite, the degree of grinding becomes an important consideration. If the electrum cannot be completely liberated, it must at least come in contact with the cyanide solutions so that the electrum particles can be dissolved. If satisfactory liberation is not attainable, roasting of pyrite may be necessary. Further, if there is much electrum intergrown with chalcopyrite, copper concentration by flotation with later gold separation may have to be considered. Finally, the presence of graphite could constitute a problem as it absorbs gold from cyanide solutions.

An adit driven in 1984-85 for underground test work should provide access to any required samples for further investigation.

6.1.5 Environmental Impact

The key waste management issues which could potentially be associated with this property, include the treatment of residual cyanides if a cyanidation process is used to extract gold from the ore; control of acid drainage from the mine waste rock piles and tailings if the property shows acid generation characteristics; and the need to control $SO_2$ emissions if a sulfide roasting process is used. These requirements could represent significant environmental control costs and will likely cause the property to be regarded as environmentally sensitive relative to its potential impact.

The most common method for the removal of cyanides from mining process waste waters are the following:

1. natural degradation in tailings pond
2. alkaline chlorination
3. patented Inco $SO_2$-air process

Other methods such as ferrous sulfide adsorption, oxidation using hydrogen peroxide, acidification, and ion exchange have found application but are not commonly used.

As noted in the foregoing sections, the mineralization is associated with sulfides and will therefore tend to be acid producing unless sufficient buffering capacity is available from the host material, waste rock, etc. If the acid production potential of the mined material exceeds its acid consumptive

capacity, a number of environmental control measures will need to be incorporated into the development, operational, and reclamation phases of the mine which will significantly increase the cost associated with each phase. In such an event, acid generating rock should not be used for the construction of roads, dams, or other fill material; storage of all acid generating material should be under conditions where contaminated runoff and seepage can be controlled, and lime neutralization treatment of all contaminated runoff and seepages will have to be provided. Provision will have to be made for the storage of treatment sludge. In addition, reclamation plans will have to address the difficult issues of providing long-term control of drainage and/or seepage from contaminated areas.

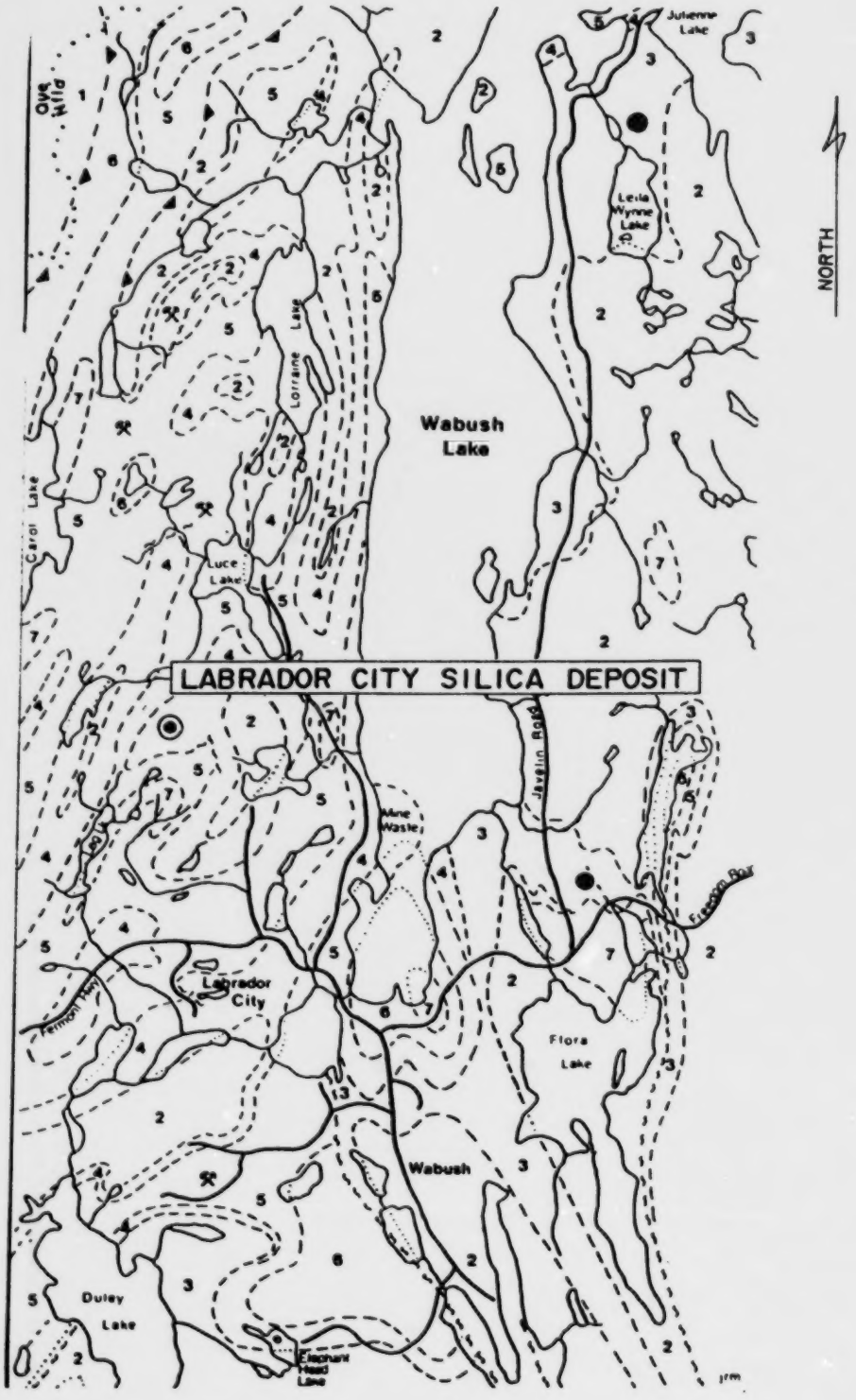
In the event that roasting of pyrite is necessary to achieve economic recoveries, provision will have to be made for scrubbing the gaseous emissions unless the $SO_2$ can be utilized in the treatment of the cyanide bearing wastes. Pilot scale testing will be required to establish the feasibility of such a process.

## 6.2 Labrador City - Silica

### 6.2.1 General

#### 6.2.1.1 Location

| | | | |
|---|---|---|---|
| District: | Wabush-Labrador City | Latitude: | 52° 59'26" |
| N.T.S. | 23-B-15 | Longitude: | 66° 56'11" |




SCALE 1: 100,000

NOLAN, DAVIS & ASSOCIATES

LABRADOR CITY SILICA DEPOSIT

LOCATION MAP

H 85 389

FIGURE 6-3

6.2.1.2 Principal Owner

Labrador Mining and Exploration Co., Ltd.

6.2.1.3 Setting

Several large ridges of Wishart quartzite lie to the west and north of Labrador City at distances of between 2 to 8 kilometres on the west side of Wabush Lake. The ridges vary in size from 100 to 3000 m in length, 10 to 700 m in width, and have up to 100 m in vertical relief. At present, the only road through this rugged terrain serves a communication tower.

6.2.1.4 Description of Deposit

a) Commodity and Associated Minerals

Silica

b) Host Rock and Character of the Deposit

The host rock is Wishart Formation quartzite of the Aphebian Knob Lake Group. It occurs as four distinct types:

1) massive white recrystallized quartzite;

2) white to grey granular quartzite with interbands of massive white and micaceous quartzite;

3) Micaceous quartzite in bands up to 1 metre thick and containing up to 10 percent muscovite, chlorite and biotite; and,

4) white friable quartzite.

c) Tonnage and Grade

One deposit, Hill No. 2907, considered the best of many excellent prospects, has a tonnage potential of in excess of 200 million tons. Preliminary sampling of this deposit by Meyer and Dean (1986) indicated the following percentages:

| | | |
|---|---|---|
| $SiO_2$ | - | 99 plus |
| $Al_2O_3$ | - | 0.09 - 0.13 |
| Total Fe | - | 0.05 - 0.07 |
| MgO | - | 0.01 - 0.02 |
| CaO | - | 0.01 - 0.03 |
| $Na_2O$ | - | 0.01 - 0.02 |
| $K_2O$ | - | 0.02 - 0.03 |
| $TiO_2$ | - | 0.01 |
| MnO | - | 0.01 |
| $P_2O_5$ | - | 0.02 |
| L.O.I. | - | 0.27 - 0.28 |

d) Previous Investigations

During 1984, the Mineral Deposits Section of the Newfoundland Department of Mines and Energy carried out preliminary sampling of quartzite ridges immediately to the north and west of Labrador City. Surface chip samples were collected perpendicular to the strike of the best exposed ridges. Analyses of these samples indicate material of relatively high purity.

It is also understood that IOC or Labrador Mining and Exploration Limited drilled 3 or 4 holes in the Wishart Formation to depths of about 200 feet each. These core should be available for viewing and/or testing in Labrador City and represent the only samples of the quartzite which are remote from the zone of weathering.

e) Corporate Interest and Support for Further Study

Labrador Mining and Exploration Company (NORCEN subsidiary) would be interested in developing the property if the feasibility becomes more evident. Nevertheless, Mr. John Stubbins has expressed his company's desire to cooperate with Canmet or the provincial Department of Mines and Energy in furthering the feasibility. Accordingly, he would be prepared to assist any such effort without monetary commitment. Since the company has recently completed their assessment work commitments, they are not required nor interested in expending any funds prior to 1988. If additional work is proposed on the property by government agencies, the company wishes to be kept informed and would expect to receive a copy of any report resulting from the work.

6.2.2 Economic Viability

Silica purchases are usually made on very precise physical and chemical specifications. Carefully graded quartz sand filter media and silica for silicon metal are examples where

the exact size frequency distribution is of paramount importance. Grain size, in terms of a high Krumbein roundness factor, is of critical significance for hydraulic fracturing sand. Both size and shape are important for sand blasting products. Unique chemical properties are significant where silica is used as an additive to some manufacturing process. Such uses demand greater care in the preparation of material and must meet rigorous chemical specifications. Prepared silica products such as silicon and ferrosilicon metal, refractory bricks, glass, manufactured abrasives, soluble silicates, specialty sands and optical silica are included in this group. The available chemical analyses suggest that the Labrador City silica would meet many of these specifications. No data is, however, available on the physical properties of the material.

Detailed studies concerning the economic viability of the product have not been undertaken to date. Current market studies being carried out for Nova Scotia and New Brunswick silica by the Mineral Policy Sector, Energy, Mines and Resources Canada, could be of interest as the same markets would, in all likelihood, be involved. The Labrador City product is believed to be of better quality than the known reserves of either Nova Scotia or New Brunswick. Therefore, it should be capable of competing favourably in this respect. However, distance from markets and consequent transporation may place the Labrador City product at a disadvantage.

One way to foster better sales and to overcome such problems as unfavourable location is to examine how to add value to the product. To do this, the producer must become market oriented rather than solely product oriented. Product demand must be maintained and increased and a higher profit margin ensured. Products of added value to consider include specialty sands, silicon and ferrosilicon metal, and cultured optical grade crystals. New technology and "high-tech" ceramics should also be considered. The following example is presented by Olmstead (1984) as an illustration of added value. Resin coated silica sand is used in oil and gas wells in geologic formations which are poorly consolidated. It acts, when pumped into a well and cured, as a filter pack around the well bore to keep out fines and maintain the well at full productivity. The added cost to the raw material is often small compared to the ultimate benefit achieved. In some instances, the added value has represented an increase of 4,400 percent over the raw material acquisition cost. The potential for a Canadian market in the offshore oil and gas industry should be investigated.

No development has been undertaken on the deposits to date. However, the amount of development required for the envisaged operation is thought to be minimal. This, together with the existing infrastructure, should permit an early commercial stage. The possible use of existing facilities with whatever modifications which may be necessary would also greatly enhance the economic viability of the deposit.

### 6.2.3 Socio-Economic Impact

The socio-economic impact of a new mining development would be very positive in a region which has suffered recent cutbacks in mineral production. Although the new industry may not necessarily be labour intensive, it would contribute to the employment opportunities of a trained work force. Additionally, the number of jobs created would be increased should the value added concept be part of any development. Some job retraining may be expected for the latter.

The impact a new development in the area would have on existing housing, transportation, utilities and community and social infrastructure should be negligible. A recent population decrease due to cutbacks in iron ore production has resulted in below capacity utilization of existing facilities. The existence of railway and port facilities precludes any need for government aid for what would be costly accessibility to the deposit.

### 6.2.4 Technology

Processing of silica, as with other minerals, requires sophisticated equipment supported by technical knowledge. The degree of crushing necessary is dependent on end-product use. Washing and, in some instances, high-density attrition scrubbing is performed to remove surficial impurities. The remaining impurities are reduced by froth flotation, magnetic separation or

high-tension electrostatic separation. After the material is dried, it is screened into the required commercial sizes. It may then be further pulverized in pebble mills to the desired grade of silica flour.

Metallurgical or processing problems which may be associated with the Labrador City deposits have not been defined. They will depend, to a large extent, on the results of preliminary size fraction analyses currently being carried out by private interests, and on the desired end-product use. Further processing or beneficiation studies are warranted even though little development work has been accomplished. The required amount of development work is thought to be minimal and could be completed in a relatively short time period.

Samples for further study are readily available from outcrop. Available geologic and mineralogical data are of a regional and general nature, respectively. Consequently, detailed studies addressing these aspects are necessary. Equipment and facilities for bulk sampling and processing may possibly be available at the nearby iron ore operations. However, equipment modification would likely be required.

### 6.2.5 Environmental Impact

The environmental implications of developing this deposit would be primarily those associated with a major quarrying operation and focus primarily on the control of

sediments in the mine drainage during the operational phase, plus reclamation related issues as a function of the post-operational phase. Neither of these issues are likely to pose particularly difficult control problems.

The deposit's proximity to recreational lands, specifically the ski facilities to the northwest, has raised some concerns. However, physiographically, it is considered sufficiently well-isolated to preclude any direct negative environmental impact on this recreational resource.

## 6.3 Ronan - Barite-Celestite

### 6.3.1 General

#### 6.3.1.1 Location

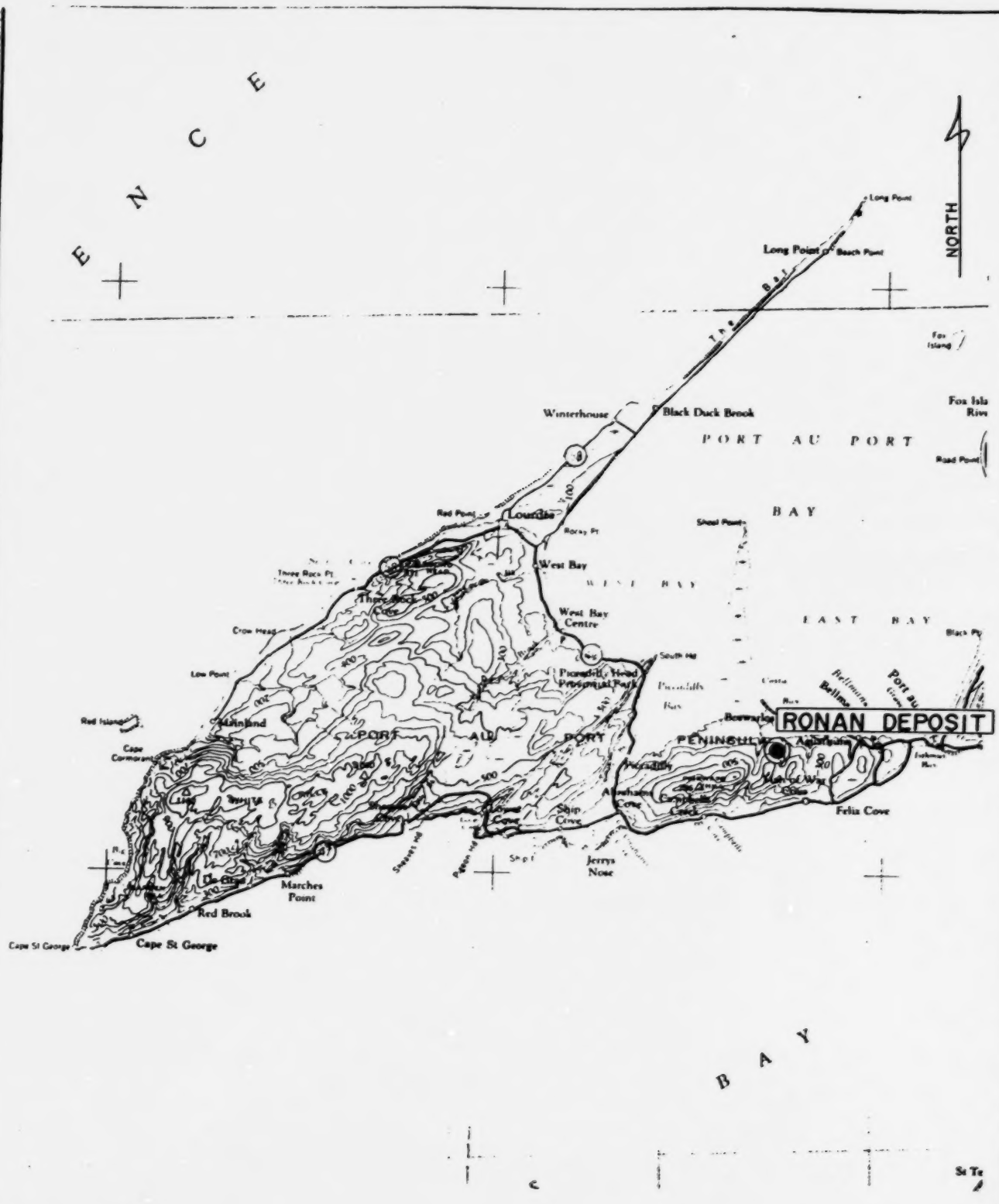
| | | | |
|---|---|---|---|
| District: | Port au Port | Latitude: | 48° 33'39" |
| N.T.S.: | 12-B-10 | Longitude: | 58° 48'58" |

#### 6.3.1.2 Principal Owner:

Leonard House
Stephenville Crossing, Newfoundland

#### 6.3.1.3 Setting

The deposit is located on a low-lying coastal area between the fishing communities of Boswarlos and Agnothuma. It has easy access from the coastal road. An existing limestone quarry is located several kilometres to the east.

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NOLAN, DAVIS & ASSOCIATES

# RONAN DEPOSIT

## LOCATION MAP

H85 389

FIGURE 6-4

6.3.1.4 Description of Deposit

a) Commodity and Associated Minerals

Barite and celestite with calcite and minor aragonite.

b) Host Rock and Character of the Deposit

The barite-celestite mineralization occurs as a wedge-shaped body in limestone of the Mississippian Codroy Group. It parallels the bedding of the Codroy strata and occupies a depression in limestone of the Table Head Group of Ordovician age. Two stages of mineralization are apparent; one replacing the limestone host rock, the other, a later open space fracture filling. The types of mineralization include: 1) intergrowths of celestite and aragonite; 2) large lenticles of celestite in muddy limestone; 3) large rounded masses of celestite; 4) intergrowths with celestite; 5) celestite in open space fillings; and 6) veins of celestite in thinly bedded limestone. Some zonation of the mineralization is also evident with celestite-rich zones alternating with barite-rich zones.

c) Tonnage and Grade

Drill indicated reserves are estimated at 135,000 tonnes of 35 percent $BaSO_4$ and 25 percent $SrSO_4$.

d) Previous Investigations

Celestite was discovered in 1923 on Hoopers Brook in the Village of Boswarlos; however, little work was reported until the 1940's. In 1942 and 1943, the Newfoundland Government carried out 910 metres of diamond drilling in 25 holes. General

exploration and diamond drilling of 155 metres in 10 holes was undertaken by the Government in 1972. This work provided the indicated tonnage and grade data.

e) Corporate Interest and Support for Further Study

Mr. Leonard House, the owner of the mineral rights to the property, is 75 years of age and does not anticipate carrying out additional exploration or development work at the site in the foreseeable future. He is, nevertheless, quite interested in seeing the deposit developed and would cooperate fully with any efforts that Canmet may be prepared to make in that direction.

### 6.3.2 Economic Viability

During the past few years, there has been considerable interest in establishing a local barite source for the offshore petroleum drilling. This interest has subsided somewhat with the reduced drilling activity. However, the current situation is, hopefully, only temporary.

The demand for celestite for the manufacture of strontium carbonate used in colour television picture tube glass and ceramic ferrite magnets has been quite strong. The manufacturing countries, the United States, Japan, and West Germany, are seeking new, assured sources as alternatives to the main current suppliers, Spain and Mexico.

Detailed study concerning the economic viability of the deposit had not been undertaken to date. Recent market studies for Nova Scotia barite and celestite may be of interest as the same markets are involved. Production and transportation costs are of critical significance if local barite is to compete with foreign sources. Nova Scotia and New Brunswick celestite deposits that are now being evaluated could be in competition for markets for that commodity. Therefore, the potential for further development may be somewhat dependent on, among other aspects, the timing of possible celestite developments elsewhere in Atlantic Canada.

### 6.3.3 Socio-Economic Impact

Although relatively few jobs may be created through the development of this resource, any small, new industry should have a positive effect on the local economy. This impact on existing housing, utilities, and community and social infrastructures should be minimal. Excellent accessibility would permit servicing from Stephenville and adjacent communities. Some government funding may, however, be required to re-establish shipping facilities near the limestone quarry at Aquathuna.

### 6.3.4 Technology

The market value of the commodities involved necessitates relatively inexpensive processing for any source to be competitive. Generally, gravitational processing is desirable. However, more costly flotation is required, particularly where other minerals or impurities are intimately associated.

Testing of samples of the Ronan deposit by the Atlantic Research Institute (Erice, 1973 and 1974) showed that heavy-media separation was not possible. Flotation tests at the same time were not successful for the deposit as a whole, whereas good results were indicated for the celestite-rich zones. The apparent problem results from barite-celestite intergrowths. The Atlantic Industrial Research Institute (1975) reported that an experiment using high-grade celestite from the deposit to make hexaferrite magnets with Wabush iron ore was successful.

Further metallurgical testing of the deposit is warranted. However, better definition of the celestite and barite rich zones should be a prerequisite. Samples for testing may be obtained from existing pits and trenches, but drill core may be required to ensure that the samples are representative of the various mineral associations and zones present.

### 6.3.5 Environmental Impact

Based on the current very limited data, it is unlikely that the development of this deposit would cause significant environmental concerns as long as sediment loadings in the mine discharge are controlled. Barium sulfate is highly insoluble and thus readily removed by sedimentation. It has no harmful characteristics in concentrations normally found in mining situations. Strontium sulfate is also relatively insoluble and is generally regarded as nontoxic to man and aquatic organisms. (Naturally occurring strontium should not be confused with Strontium-90 which is a product of nuclear fission and ranked second only to Radium-226 as a hazard to human health.)

The fact that Gillams Brook passes through the deposit may be of greater concern if its use as a domestic water supply is considered in the future, since it was used for this purpose in the past.

## 6.4 Strange Lake (Zirconium-Yttrium-Niobium-Rare Earths)

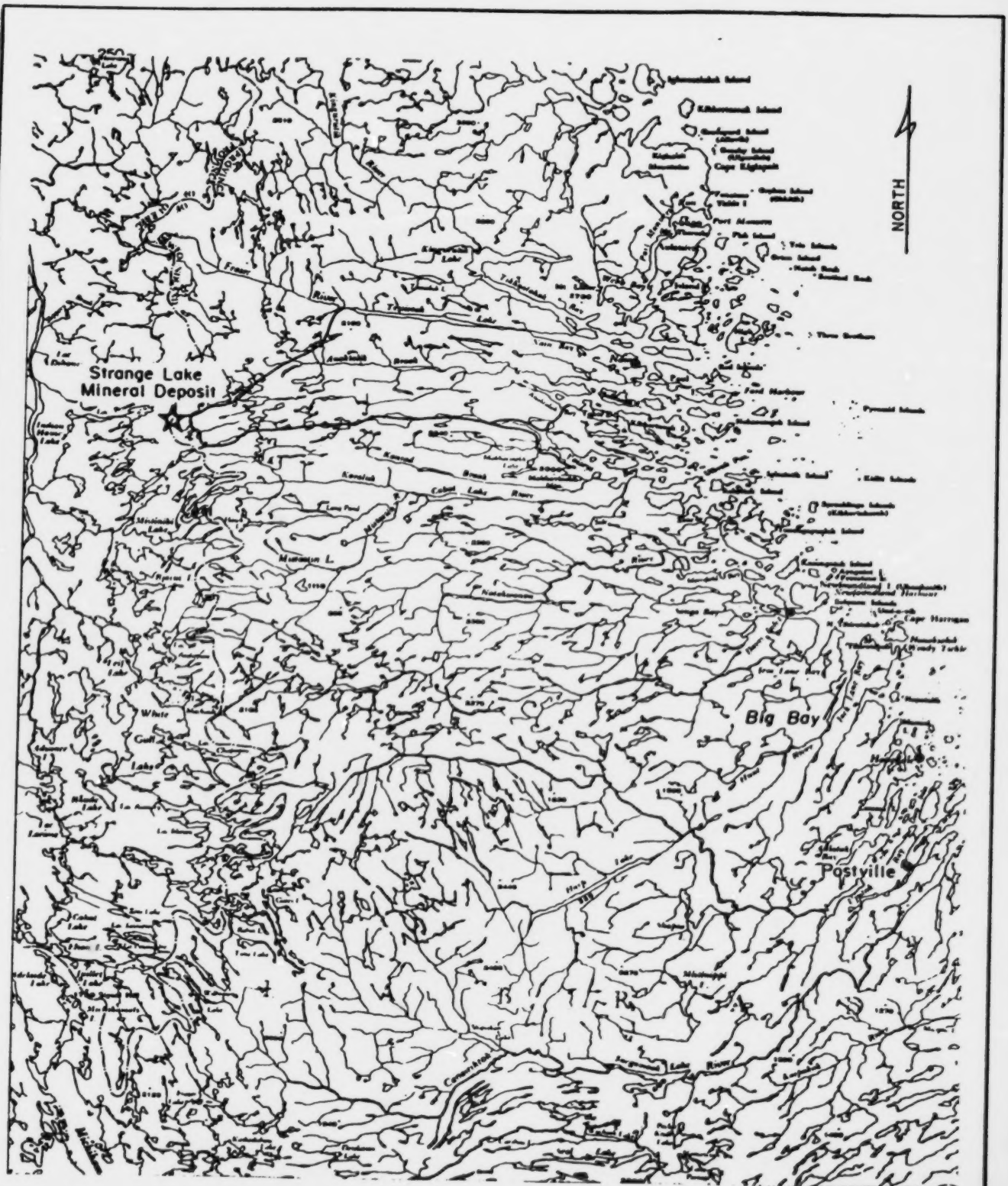
### 6.4.1 General

#### 6.4.1.1 Location

| | | | |
|---|---|---|---|
| District: | Nain, Labrador | Latitude: | 56° 00' |
| N.T.S.: | 24-A-8 | Longitude: | 64° 18' |

#### 6.4.1.2 Principal Owner

Iron Ore Company of Canada

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NOLAN, DAVIS & ASSOCIATES

STRANGE LAKE DEPOSIT
LOCATION MAP

H85 389-

FIGURE 6-3

6.4.1.3 Setting

The deposit is in a very remote location in a flat plateau of approximately 600 metres above sea level. The plateau is generally barren, devoid of trees, and contains numerous small lakes. Coastal fiords penetrate the plateau to the east of the deposit.

6.4.1.4 Description of Deposit

a) Commodity and Associated Minerals

Zirconium, yttrium, niobium, rare earths with associated beryllium, fluorine, uranium, and thorium.

b) Host Rock and Character of Deposit

The reported mineralization is hosted by metagneiss and peralkaline granite phases of the Churchill Province adamellite, the Strange Lake Alkalic Complex. Although few details are available, the higher grade mineralized sections are supposedly associated with pegmatitic-aplitic dikes and veins.

c) Tonnage and Grade

No published data is available for tonnage and grade; nevertheless, quantities in excess of 25 million tonnes are suspected. Unpublished analytical data suggests the following grade: 3.25 percent $ZrO_2$; 0.12 percent BeO; 0.66 percent $Y_2O_2$; 0.56 percent $Nb_2O_5$; and, 1.3 percent REE.

d) Previous Investigations

In 1979 and 1980, based on airborne radiometrics, the Iron Ore Company of Canada undertook general exploration and drilled 48 holes to depths from 14.63 to 84.73 metres. Work continued in 1981 with 95 holes drilled to depths from 1 to 14.02 metres. Further drilling was reported from 1981 to 1983, but no data on this is available. No recent investigations have been reported.

e) Corporate Interest and Support for Further Study

Mr. Steve Zajax of the Iron Ore Company of Canada (Hanna) was contacted to determine that company's interest in future development of the Strange Lake prospect. According to him, the Iron Ore Company is heavily committed to a number of projects which, at present, have a higher priority than the development of Strange Lake. Nevertheless, they would be prepared to entain a proposal for further assessment work by Canmet and would cooperate in this regard. It is Mr. Zajax's option, however, that additional market studies may be of more benefit at this time than more direct assessment of the deposit.

6.4.2 Economic Viability

The deposit is considered a developed prospect. It is understood that "in-house" feasibility and marketing studies have been undertaken; however, the results are not publicly available.

Regardless, the potential for development should be very good. The gross value of the deposit, particularly at current market prices for yttrium, is quite good. A forecast 10 percent annual increase in commodity comsumption is also favourable. Use of the product in new technology, such as ceramic automobile engines, could be significant, but addimittedly, hard data on the potential for these markets is difficult to obtain.

The tonnage and metal value of the Strange Lake deposits gives it a greater potential than the beryllium-niobium deposit at Letitia Lake, also in Labrador. It has a similar advantage over the only other significant Canadian deposit of this type at Thor Lake in the Northwest Territories.

### 6.4.3 Socio-Economic Impact

Due to the location of the deposit, considerable study is required on the socio-economic impact any new development would have on this region. The lack of existing infrastructure, transportation facilities, and possible seasonal operation are important considerations. Transportation alternatives need to be investigated, and the merits judged of overland transport to existing iron ore operations versus overland to coastal Nain.

Positive benefits would result from job creation in the industry-poor region. Both the local labour force and unemployed miners in the province would benefit. Some complications need, nevertheless, to be considered should the operation be of a seasonal nature.

### 6.4.4 Technology

The milling and processing of the Strange Lake ore is likely to be costly. The suspected complex mineralogy will undoubtedly make it difficult to obtain separate concentrates for the various minerals. Some combination of flotation and acid leaching will likely be required to obtain the desired product or products.

It is understood that the owner has carried out some testing, but the results have not been reported. It is conceivable that not all the problems with processing have been identified; therefore, both mineralogical and metallurgical testing may be warranted. Samples required for this testing should be readily available from existing open cuts.

### 6.4.5 Environmental Impact

The environmental issues associated with this property will likely focus on the presence of uranium and thorium in the ore. Public concerns over the potential impact of radioisotopes

in the food chain are often encountered as a function of developing mining properties containing uranium and other radioactive minerals.

To alleviate these concerns, it will be necessary to undertake a thorough assessment of potential radionuclide pathways in the local physical environment and food chains and to develop the mining facilities to reduce any impact to acceptable levels. Location and construction of a tailings disposal area so as to prevent contamination of local surface and groundwaters will be of particular importance in this regard, as will wind erosion of the tailings and other waste areas. Removal of Radium-226 by the addition of barium chloride to the tailings decant will likely be required, as will a commitment to provide a permanent cover to the surface of the tailings area at the post-operational stage.

## 6.5 Tulks Hill - Zinc, Lead, Copper

### 6.5.1 General

#### 6.5.1.1 Location

District: Buchans — Latitude: 48° 29'24"

N.T.S.: 12-A-11 — Longitude: 57° 13'36"

#### 6.5.1.2 Principal Owner

B.P. Selco

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NOLAN, DAVIS & ASSOCIATES

TULKS HILL DEPOSIT
LOCATION MAP

H85 389

FIGURE 6-6

6.5.1.3 Setting

The deposit is located in an isolated, hilly, and treed area to the south of Red Indian Lake. The town of Buchans is situated on the north shore of this lake, but there is currently no road access to the general area of the deposit.

6.5.1.4 Description of Deposit

a) Commodity and Associated Minerals

Sphalerite, galena, and chalcopyrite with associated pyrite, pyrrhotite, marcasite, arsenopyrite, argentian tetrahedrite, magnetite, ilmenite, and hematite. Oxidation and supergene alteration has resulted in the formation of digenite, covellite, and anglesite.

b) Host Rock and Character of Deposit

The host rock includes felsic and sericitic tuffs and breccias of the Early to Middle Ordovician Victoria Lake Group. The deposit is comprised of four mineralized horizons of disseminated pyrite which grade laterally into heavily mineralized zones of banded massive sphalerite, galena, chalcopyrite, and pyrite.

c) Tonnage and Grade

Published data indicate 800,000 tonnes containing 5.6 percent zinc, 2.0 percent lead, 1.3 percent copper, 41 grams/tonne silver, and 0.4 grams per tonne gold.

d) Previous Investigations

The bulk of the investigations by the owner remains confidential and, thus, not publicly available. Diamond drilling is reported to have begun in 1963. A total of 1,084 metres of diamond drilling has been reported for 1977. However, there is no record of subsequent exploration activity. Research work includes an M.Sc. thesis at Memorial University by G.E. Cooper (1966), regional mapping by B.E. Kean of the Newfoundland Department of Mines and Energy (1977), and mineralogical studies by Dr. J.L. Jambor of Canmet (1984).

e) Corporate Interest and Support for Further Study

B.P. Selco are interested in further development of the Tulks Hill deposit and may seek the support of another partner on a joint venture basis. They would be quite willing to consider additional support by Canmet and would, therefore, be willing to supply data from the previous assessment work.

6.5.2 Economic Viability

The current status of the deposit is that of a developed prospect. It was considered in 1976 by the Buchans Task Force as a possible ore source for the continuation of mining activity at Buchans.

Feasibility and market studies, if undertaken, have not been reported. However, even though current base metal markets are depressed, deposits in the Buchans area require particular consideration because of their location and the existing infrastructure. The existence of processing facilities, regardless if some reconditioning is likely to be required, is an important economic consideration. Additionally, the relatively high zinc values, in comparison with other Newfoundland prospects, make the deposit a potential candidate for development with any future improvement in the metal markets.

Unavailablity of detailed geologic data makes it impossible to comment on the degree of delineation of the deposits. As the reported tonnage may be considered marginal, hopefully, further exploration and development will result in the discovery of extensions to the known mineralized zones or to new zones in adjacent areas.

### 6.5.3 Socio-Economic Impact

The socio-economic impact of a new mining development would be very positive for the Buchans area which a few years ago experienced cessation of mining activity after fifty years of operation. Although many of the employees of the previous operation may now be otherwise occupied, a portion of the trained work force may be available. Certainly, if need be, trained

miners would be available elsewhere in the province. Equally important is that a population exists which understands mining and its related activities. Thus, the need for any public awareness program that new developments sometimes require is eliminated.

The impact of a new development in the Buchans area on existing housing, transportation facilities, utilities, and community and social infrastructure is thought to be negligible. The cessation of the previous operation has resulted in below capacity utilization of existing facilities.

### 6.5.4 Technology

It is understood that the Tulks Hill deposit is perhaps less complex with respect to processing than other Buchans area deposits. The textures and grain sizes of the sulphide minerals are such that they readily permit liberation. The grain size of the sulphide minerals is generally coarse. As textures are simple and mineral intergrowths virtually absent, even the finer-grained portions of the deposits are not thought to present processing problems.

Recent testing by the previous owners did, however, reportedly result in unsatisfactory metal recoveries. Jambor (1984) thought that this was mainly due to the use of a grind too

coarse to permit liberation of the sulphide minerals. He also expressed concern regarding the effects of oxidation and supergene alteration on metal recovery.

Further study and testing is, therefore, warranted. These tests should be carried out from different parts of the deposits to ensure that they are representative of the entire deposit. In this way, all potential problems may be recognized and resolutions sought. Drill core samples are thought necessary to provide the required distribution of samples for laboratory testing. Bulk sampling and bulk testing could possibly be undertaken utilizing existing processing facilities at Buchans. Some reconditioning of these facilities is likely required.

### 6.5.5 Environmental Impact

Based on the limited information available at this time, it would appear that the generation of acid drainage through the oxidation of the massive sulfides existing at the site will likely pose the major environmental problem. At base metal sites, the generation of acid results not only in surface drainage of low pH, but also in the leaching of heavy metals into solution, resulting in high levels of toxicity to fish and other aquatic organisms. The implications of dealing with such drainage have already been briefly reviewed in Section 6.1.5.

## 7.0 CONCLUSIONS AND RECOMMENDATIONS

A review of available data on 19 mineral deposits in Newfoundland and Labrador has been accomplished. This review has permitted the selection of five deposits for which further mineralogical and metallurgical research and possible development are warranted. The five deposits are: 1) Cape Ray (gold); 2) Labrador City (silica); 3) Ronan (barite-celestite); 4) Strange Lake (zirconium-yttrium-niobium-rare earths); and, 5) Tulks Hill (zinc-lead-copper).

In addition to mineralogical and metallurgical studies, feasibility, environmental, and market studies and appropriate mining techniques for each deposit need to be considered in some detail prior to actual development. Detailed evaluation of these latter aspects was beyond the scope of the present study, and in most instances, there was insufficient data available for even preliminary assessment.

As all five of the above mentioned deposits are considered to have some development potential and as aspects like job creation were common to all, a rating scheme has been devised so that the requirement that two deposits are selected for further research is achieved. The favourability of the pertinent evaluation criteria are judged as low, moderate, or high for each deposit. Positive attributes are assigned a high rating, whereas negative attributes are assigned a low rating.

Some of the attributes which were considered are as follows. If the current market conditions are poor, and tonnages and grades marginal, the deposit was rated low for economic viability, e.g., Tulks Hill and Ronan. If most of the required infrastructure is already in place and if development would augment an existing or re-establish a previous mining base, a high socio-economic rating was assigned, e.g., Labrador City and Tulks Hill. A high rating was also assigned in those instances where the necessary technology was believed straightforward or readily attainable, e.g., Tulks Hill and Labrador City. The greater the environmental impact, the lower the rating assigned, e.g., Strange Lake. Finally, indicated support and cooperation for further study received a high rating, e.g., Labrador City.

Based on the above scheme, the deposits which were reviewed in detail were rated as follows: I) Labrador City; II) Tulks Hill; III) Cape Ray; IV) Ronan; and, V) Strange Lake. Table II summarizes and illustrates the above described rating scheme.

It is, therefore, recommended that further mineralogical and metallurgical research be undertaken on the silica deposits at Labrador City and on the zinc-lead-copper deposits at Tulks Hill. It follows from the rating scheme that should any unforeseen difficulties arise in the research of either or both of these deposits, the next most highly rated deposit or deposits could serve as alternatives.

TABLE II

FAVOURABILITY RATING OF EVALUATION CRITERIA
FOR DEPOSITS REVIEWED IN DETAIL

| Rating | Deposit | Economic Viability | Socio-Economic Impact | Technology | Environmental Favourability | Corporate Interest |
|---|---|---|---|---|---|---|
| I | Labrador City | high | high | high | high | high |
| II | Tulks Hill | low | high | moderate | low | high |
| III | Cape Ray | moderate | moderate | moderate | low | high |
| IV | Ronan | low | moderate | low | high | high |
| V | Strange Lake | high | low | low | low | low ? |

# APPENDIX I

## Data Sheets, Selected Mineral Deposits

DATA SHEET - NEWFOUNDLAND MINERAL EVALUATION

DEPOSIT NAME: Buchans Tailings COMMODITY: Barite

PLACE OR DISTRICT: Buchans N.T.S.: 12-A-15

HOST ROCK: Tailings from former base metal operation.

CHARACTER:
Barite in tailings. Up to 38 percent barite occurs as gangue mineral in the massive sulphide deposits.

TONNAGE: 450,000 tonnes GRADE: 46% $BaSO_4$

PREVIOUS INVESTIGATIONS:
In 1957, Asarco carried out a pilot plan test run which indicated project was not feasible. Asarco-Abitibi Price-N.L. Bariod, from 1976 to 1981, developed new flotation process and constructed barite plant.

ECONOMIC VIABILITY:
High transportation costs make it difficult to compete with cheaper foreign sources.

SOCIO-ECONOMIC IMPACT:
Minor, but positive impact for the Town of Buchans, a former mining town.

TECHNOLOGY:
Initial recovery problems of new plant because of the fineness of grain size have reportedly been overcome.

ENVIRONMENTAL IMPACT:
Little impact as operation is located in a previous mining environment.

CONCLUSIONS AND RECOMMENDATIONS:
Problems are apparently economic rather than technological; therefore, no further study is recommended at this time.

## DATA SHEET - NEWFOUNDLAND MINERAL EVALUATION

DEPOSIT NAME: Colchester COMMODITY: Copper

PLACE OR DISTRICT: Green Bay N.T.S.: 12-H-9

HOST ROCK: Chlorite schist zone in pillow lavas of the Ordovician Lush's Bight Group.

CHARACTER:

Ore in parallel and en echelon lenses. Chalcopyrite occurs in blebs, disseminations, stringers, veins, and irregular masses. Mineralization is erratic, cut by barren dikes and faulted.

TONNAGE: 1,000,000 tonnes GRADE: 1.3% Cu

PREVIOUS INVESTIGATIONS:

Some production around the turn-of-the-century. From 1966 to 1967, Colchester Mines Ltd. undertook general exploration and drilled 5,008.5 m in 28 holes. Cerro continued this work in 1969 and 1970 and drilled 7,587.8 m in 26 holes. Later the same year, Brinex drilled 9 holes and reported only minor mineralization.

ECONOMIC VIABILITY:

Not considered viable because of erratic nature of mineralization and low metal prices.

SOCIO-ECONOMIC IMPACT:

Positive impact on job creation; however, some infrastructure may be required.

TECHNOLOGY:

No processing problems defined. Simple mineralogy should permit liberation of copper sulphides.

ENVIRONMENTAL IMPACT:

Impact could be lessened through reclamation. Potential for acid generation not assessed at this time.

CONCLUSIONS AND RECOMMENDATIONS:

No further study recommended at this time.

## DATA SHEET - NEWFOUNDLAND MINERAL EVALUATION

DEPOSIT NAME: Great Bend COMMODITY: Magnesite

PLACE OR DISTRICT: Fortune Bay - Hermitage N.T.S.: 2-D-11

HOST ROCK: Schistose and brecciated facies of serpentinized peridotite facies of the Great Bend Ultramafic Complex.

CHARACTER:

Serpentinized peridotite altered to magnesite in shear zones 8 to 10 m wide and from 30 to 60 m long, and in breccia zones a few hundred metres wide and up to 300 m long.

TONNAGE: 136,050 tonnes GRADE: 29.87% MgO

PREVIOUS INVESTIGATIONS:

1953-54: mapping and sampling by the Newfoundland Government.

1971-72: sampling by Nalco and a mineralogical study by Canmet.

ECONOMIC VIABILITY:

Considered an exploration target. Although magnesite demand is expected to grow annually at a 4-5% rate, production from British Columbia and Quebec could influence marketability.

SOCIO-ECONOMIC IMPACT:

Positive effect on employment, however, lack of infrastructure imparts a generally negative effect.

TECHNOLOGY:

Cooper (1957) stated that flotation tests indicated the concentration middlings and tailings were equal amounts of about one-third. Regrinding to minus 200 mesh and refloating it allowed for a cencentrate containing 8.6% $SiO_2$ . Soles (1972) thought that a flotation technique may be effective to reduce the talc content, but fine grinding would be necessary to liberate dispersed talc from magnesite.

ENVIRONMENTAL IMPACT:

No insurmountable problems envisaged as product is considered to be chemically inert, particularly if land reclamation is provided for.

CONCLUSIONS AND RECOMMENDATIONS:

Not considered viable because of low reported tonnage. Further study should be considered if future exploration increases available tonnage and if markets are favourable.

## DATA SHEET - NEWFOUNDLAND MINERAL EVALUATION

DEPOSIT NAME: Great Burnt Lake COMMODITY: Copper

PLACE OR DISTRICT: Central Newfoundland N.T.S.: 12-A-8

HOST ROCK: Cold Spring Pond Formation of mafic flows and tufts of the Lower to Middle Ordovician Baie d'Espoir Group.

CHARACTER:

Chalcopyrite is distributed throughout a tabular, conformable body of massive pyrrhotite. It occurs as large blebs as well as discrete strata of massive mineralization up to 6 cm thick.

TONNAGE: 757,500 tonnes GRADE: 2.915% Cu

PREVIOUS INVESTIGATIONS:

Discovered in 1964, drilling to date has totalled 20,351 m in 132 holes.

ECONOMIC VIABILITY:

Not considered viable at current market prices.

SOCIO-ECONOMIC IMPACT:

Possible utilization of Buchans facilities would have a positive impact on that area.

TECHNOLOGY:

Fine-grain size and chalcopyrite-pyrrhotite intergrowths could make liberation of chalcopyrite difficult.

ENVIRONMENTAL IMPACT:

Could be acid producing, thus requiring control treatment during operations. Reclamation potentially difficult.

COMMENTS:

The South Pond deposit, 10 km to the north contains 323,000 tons of 1.3% copper.

CONCLUSIONS AND RECOMMENDATIONS:

No further study recommended at this time.

## DATA SHEET - NEWFOUNDLAND MINERAL EVALUATION

DEPOSIT NAME: Lake Bond COMMODITY: Zinc, Copper

PLACE OR DISTRICT: Buchans N.T.S.: 12-H-1

HOST ROCK: Altered andesite and basaltic pillow flows of the Upper Ordovician Roberts Arm Group.

CHARACTER:
Stockwork with disseminations, stringers, veinlets, and masses of pyrite with lesser amounts of sphalerite, chalcopyrite, galena, and pyrrhotite.

TONNAGE: 1,096,699 tonnes GRADE: 2.12% Zn, 0.31% Cu

PREVIOUS INVESTIGATIONS:
New Jersey Zinc, from 1952 to 1961, undertook general exploration which led to the discovery. Subsequently, this company carried out over 5,738 m of drilling to delineate the deposit. A further 549.7 m in 3 holes was drilled by Consolidated Morrison in 1976.

ECONOMIC VIABILITY:
Not economically viable at current market prices.

SOCIO-ECONOMIC IMPACT:
Many positive benefits for Buchans area.

TECHNOLOGY:
No problems defined. Insufficient geological and mineralogical data to evaluate.

ENVIRONMENTAL IMPACT:
Little incremental impact as operation would be located in a previous mining environment. Control of acid generation a potential concern.

CONCLUSIONS AND RECOMMENDATIONS:
No further studies recommended at this time.

## DATA SHEET - NEWFOUNDLAND MINERAL EVALUATION

DEPOSIT NAME: La Scie COMMODITY: Silica

PLACE OR DISTRICT: Baie Verte Peninsula N.T.S.: 2-E-13

HOST ROCK: Silicic, intermediate and basic volcanic rocks of the Silurian Cape St. John Group which have been intruded by the La Scie Granite of Carboniferous age.

CHARACTER:

Quartz vein in granite which pinches out near granite-volcanic rock contact.

TONNAGE: 747,368 tonnes GRADE: 98.0% $SiO_2$

PREVIOUS INVESTIGATIONS:

During 1974-1975, the Newfoundland Department of Mines and Energy carried out surface sampling and drilled 571 metres in 7 holes.

ECONOMIC VIABILITY:

Considered a developed prospect. Labrador City and Fortune Bay deposits are considered more viable.

SOCIO-ECONOMIC IMPACT:

Minimal positive effects as job creation would be limited. Some infrastructure may be required.

TECHNOLOGY:

No problems defined. However, recent tests by private interests apparently indicated that the product was not suitable for silica brick production.

ENVIRONMENTAL IMPACT:

No insurmountable problems are envisaged, particularly as product is considered chemically inert.

CONCLUSIONS AND RECOMMENDATIONS:

No further study recommended at this time.

## DATA SHEET - NEWFOUNDLAND MINERAL EVALUATION

DEPOSIT NAME: Letitia Lake

COMMODITY: Beryllium, Niobium

PLACE OR DISTRICT: Naskaupi, Labrador

N.T.S.: 13-L-1

HOST ROCK: A mylonite zone associated with faulting in aegirine-arfvedsonite-riebeckite-aenigmatite syenite.

CHARACTER:

Mineralization occurs in four enriched zones of elliptical shape which parallel the regional foliation.

TONNAGE: 7,150,431 tonnes

GRADE: 0.39% BeO

PREVIOUS INVESTIGATIONS:

General exploration undertaken by Kennco Explorations in 1956. In 1957, Frobisher Ltd. drilled 13 short holes. From 1959 to 1967, Rio Tinto Canada undertook general exploration and drilled 513 m in four holes and defined the four mineralized zones.

ECONOMIC VIABILITY:

Considered a developed prospect. Thought uneconomic because of low grade, mainly beryllium content.

SOCIO-ECONOMIC IMPACT:

Development costs and need for infrastructure could outweigh job creation benefits.

TECHNOLOGY:

Ore dressing tests by Kennco Explorations in 1956 indicated recovery of ore minerals difficult due to low grade and fine-grained ore.

ENVIRONMENTAL IMPACT:

Insufficient data to access.

CONCLUSIONS AND RECOMMENDATIONS:

No further study recommended at this time.

## DATA SHEET - NEWFOUNDLAND MINERAL EVALUATION

DEPOSIT NAME: Michelin COMMODITY: Uranium

PLACE OR DISTRICT: Makkovik N.T.S.: 13-J-12

HOST ROCK: Porphyritic metarhyolite of the Aphebian Upper Aillik Group.

CHARACTER:

A series of tabular zones containing disseminations and/or clusters of pitchblende grains associated with mafic minerals.

TONNAGE: 7,181,000 tonnes (mineable) GRADE: 0.12% $U_3O_8$

PREVIOUS INVESTIGATIONS:

Discovered in 1968. From 1968 to 1980, Brinex undertook general exploration and some development. Work included 13,775 m of diamond drilling in 148 holes. Feasibility and environmental impact studies have also been undertaken.

ECONOMIC VIABILITY:

Not considered viable because of current market prices.

SOCIO-ECONOMIC IMPACT:

Job creation would be a positive benefit for this region of Labrador. However, because of location, all necessary infrastructure has to be established.

TECHNOLOGY:

No problems in processing have been reported. Production of yellow cake is thought to be straightforward by acid leach-solvent extraction process.

ENVIRONMENTAL IMPACT:

Further development has been halted by government order because of environmental concerns.

CONCLUSIONS AND RECOMMENDATIONS:

Development difficulties are related to market and environmental aspects rather than processing. Therefore, no further study is recommended at this time.

## DATA SHEET - NEWFOUNDLAND MINERAL EVALUATION

DEPOSIT NAME: Pilley's Island COMMODITY: Copper

PLACE OR DISTRICT: Notre Dame Bay N.T.S.: 2-E-12

HOST ROCK: Rhyolite member of the Roberts Arm Group of Upper Ordovician to Silurian Age.

CHARACTER:
Three main zones; two upper massive sulphide zones and a lower stockwork zone.

TONNAGE: 1,051,436 tonnes GRADE: 1.23% Cu

PREVIOUS INVESTIGATIONS:
Some pyrite production in the early 1900's. Recent work from 1966 to present included 9,821.6 metres of diamond drilling in 39 holes.

ECONOMIC VIABILITY:
Not economically viable at current market prices.

SOCIO-ECONOMIC IMPACT:
Positive benefit with regard to job creation, however, infrastructure would be required.

TECHNOLOGY:
No problems defined. Grain size is reported to be variable.

ENVIRONMENTAL IMPACT:
Acid generation a potential concern.

COMMENTS:
Follow-up investigations of nearby Cu-Pb-Zn mineralization known as the Bull Road Prospect is understood to have produced significant results. However, this is unconfirmed and unreported; therefore, no evaluation would be achieved.

CONCLUSIONS AND RECOMMENDATIONS:
No further study recommended for the known and reported mineralization.

## DATA SHEET - NEWFOUNDLAND MINERAL EVALUATION

DEPOSIT NAME: St. Georges COMMODITY: Potash

PLACE OR DISTRICT: St. Georges N.T.S.: 12-B-7

HOST ROCK: Mississippian Codroy Group of sandstone, siltstone, and shale with gypsum and anhydrite.

CHARACTER:
Sylvite and carnallite in salt horizons.

TONNAGE: None published-prospect GRADE: Best Section -
Sylvite - 14.1% $K_2O$ over 1.2 m
Carnallite - 8.33% $K_2O$ over 8.35 m

PREVIOUS INVESTIGATIONS:
In 1968, Hosker Chemical Corp. carried out a gravity survey and drilled one hole to 1,080 m. Amax in 1976 drilled two holes, but failed to intersect salt. Pronto Exploration in 1981 drilled 2 holes which intersected several potash zones.

ECONOMIC VIABILITY:
Considered an exploration target. Excellent potential for the discovery of additional potash zones.

SOCIO-ECONOMIC IMPACT:
Positive effect on job creation. All necessary infrastructure in place in the surrounding communities.

TECHNOLOGY:
There are mining problems in that carnallite, the most abundant potash mineral deliquesces at a relatively low humidity. However, this could possibly be overcome by solution mining.

ENVIRONMENTAL IMPACT:
Some problem likely involved with the disposal of non-commercial by-product salt.

CONCLUSIONS AND RECOMMENDATIONS:
Considered an exploration target; therefore, no further study recommended at this time.

DATA SHEET - NEWFOUNDLAND MINERAL EVALUATION

DEPOSIT NAME: Skidder COMMODITY: Copper, Zinc

PLACE OR DISTRICT: Buchans N.T.S.: 12-A-10

HOST ROCK: Basaltic pillow lavas, pillow breccias, and aquagene tuffs of the Skidder Basalt unit of Ordovician Age.

CHARACTER:
Three types of mineralization: 1) stockwork quartz-pyrite; 2) massive non-bedded pyrite with minor chalcopyrite and sphalerite; and, 3) massive laminated pyrite with interlaminated chalcopyrite and sphalerite. The massive sulphides occur as lens-shaped bodies with closely associated chert-jasper.

TONNAGE: 900,000 tonnes GRADE: 2% Cu, 2% Zn, Minor Pb and Ag

PREVIOUS INVESTIGATIONS:
Discovered in 1971. From 1971 to 1977, 7,794 metres drilled in 38 holes by Asarco.

ECONOMIC VIABILITY:
Developed prospect status. Thought uneconomic at current metal prices.

SOCIO-ECONOMIC IMPACT:
Many positive benefits for the Buchans area.

TECHNOLOGY:
No apparent processing problems. Grain size and texture suitable for liberation of sulphide minerals.

ENVIRONMENTAL IMPACT:
Little incremental impact as deposit is located in a previous mining environment. Acid generation a potential concern.

CONCLUSIONS AND RECOMMENDATIONS:
Not considered viable because of reported tonnage and grade. Further study should be considered if future exploration increases available tonnage or if markets are favourable.

## DATA SHEET - NEWFOUNDLAND MINERAL EVALUATION

DEPOSIT NAME: Strickland COMMODITY: Lead, Zinc, Silver

PLACE OR DISTRICT: La Poile N.T.S.: 10-0-16

HOST ROCK: At the contact between felsic pyroclastic lava with siliceous tuff or chert and overlying sedimentary rocks of the Ordovician Bay du Nord Group.

CHARACTER:
Massive sphalerite-galena-argentiferous pyrite zones.

TONNAGE: 260,000 tonnes GRADE: 5.75% Pb-Zn, up to 195 g/t. Ag

PREVIOUS INVESTIGATIONS:
Discovered in 1936. Venture Limited drilled 718.6 m in 10 holes in 1937 and defined the mineralized zone. In 1966, Kopan Development Ltd. drilled 1,216.8 m in 10 holes. Looking for downdip extensions, Long Lac Minerals drilled 1,532 m in 18 holes in 1968-69. Falconbridge, 1977-80, carried out general exploration and drilled 14 holes in search of extension, but encountered low metal value.

ECONOMIC VIABILITY:
The tonnage is considered too small for the deposit to be economic.

SOCIO-ECONOMIC IMPACT:
All infrastructure required because of the deposit's location.

TECHNOLOGY:
No processing problems defined. Grain size and texture considered suitable for the liberation of sulphide minerals.

ENVIRONMENTAL IMPACT:
Acid generation a potential concern.

CONCLUSIONS AND RECOMMENDATIONS:
No further study recommended.

## DATA SHEET - NEWFOUNDLAND MINERAL EVALUATION

DEPOSIT NAME: Tally Pond (Boundary) COMMODITY: Zinc, Copper, Silver

PLACE OR DISTRICT: Buchans N.T.S.: 12-A-9

HOST ROCK: Tally Pond volcanics of the Early to Middle Ordovician Victoria Lake Group. Rock types include coarse felsic volcanics (quartz-eye rhyolite and quartz-feldspar porphyry) and felsic lapilli tuff.

CHARACTER:

Three zones of massive sulphides. Fine-grained pyrite with variable amounts of chalcopyrite, sphalerite, and covellite. Locally minor galena. The massive sulphides are underlain by stockwork of chlorite-pyritic-chalcopyrite.

TONNAGE: Confidential GRADE: Confidential

PREVIOUS INVESTIGATIONS:

A Noranda-Abitibi Price joint venture, between 1979 and 1982, undertook general exploration and reportedly drilled 15 holes. All data is confidential.

ECONOMIC VIABILITY:

Not considered viable. Tonnage is understood to be less than one-half million.

SOCIO-ECONOMIC IMPACT:

Many positive effects for Buchans area.

TECHNOLOGY:

No problems have been defined. Deposit is the subject of a confidential Canmet study.

ENVIRONMENTAL IMPACT:

Little incremental impact as operation would be located in a previous mining environment. Acid generation a potential concern.

CONCLUSIONS AND RECOMMENDATIONS:

Confidentiality of data precludes evaluation.

## DATA SHEET - NEWFOUNDLAND MINERAL EVALUATION

DEPOSIT NAME: York Harbour COMMODITY: Copper, Zinc

PLACE OR DISTRICT: Bay of Islands N.T.S.: 12-G-1

HOST ROCK: Intensely altered zone that separates two members of a pillow lava sequence with ophiolites of the Lower Ordovician Bay of Island Complex.

CHARACTER:

Two types of mineralization: 1) lenses of brecciated massive pyrite with sphalerite and chalcopyrite; and, 2) chalcopyrite stringers in altered lavas which overlay massive sulphides.

TONNAGE: 282,000 tonnes GRADE: 1.92% Cu, 4.67% Zn

PREVIOUS INVESTIGATIONS:

Some production in early 1900's; however, property was not actively explored between 1951 and 1978. During this period, a total of 13,349 m of diamond drilling was accomplished by Independent Mining, Big Nama Creek Mines, Long Lac Minerals, and York Harbour Consolidated Exploration. Some underground work was carried out by Big Nama Creek Mines in 1965 and by Long Lac Minerals in 1970.

ECONOMIC VIABILITY:

Not economically viable because of low tonnage.

SOCIO-ECONOMIC IMPACT:

Positive impact on job creation; however, all infrastructure required.

TECHNOLOGY:

Queens University study in 1951 obtained an 87% recovery in a 26% Cu concentrate, and a 77% recoverey in a 51% Zn concentrate. Granite size and texture suitable for liberation, so recoveries could be improved.

ENVIRONMENTAL IMPACT:

Acid generation a potential concern.

CONCLUSIONS AND RECOMMENDATIONS:

Not considered economical because of low tonnage and lense-like character of deposit. Therefore, no further study recommended.

# APPENDIX II

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## (Detailed Study Area)

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